March 3, 2000

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**SUBJECT:** **Review of January Work Plans Related to Molycorp's Closeout Plan for Mine Site and Tailings Facility, TA001RE (96-1)**

Dear Mr. Shoemaker:

The Mining and Minerals Division (MMD) has reviewed 9 work plans submitted by Molycorp Inc. addressing the collection of data and information to be developed relative to the Questa Mine's Closeout Plan. These work plans were submitted in accordance with the schedule of deliverables as required by the Director's December 30, 1999 Order for an extension of time to obtain closeout plan approval. The work plans were submitted by Molycorp on the dates provided below:

1. 1/21/00 - Work Plan for Surface Erosion and Stability Analysis - Mine Site;
2. 1/21/00 - Work Plan for Surface Erosion and Stability Analysis -Tailings Facility;
3. 1/31/00 - Work Plan for Borrow Materials Investigation - Tailings Facility;
4. 1/31/00 - Work Plan for Borrow Materials and Rooting Zone Investigation – Mine Site;
5. 1/31/00 - Work Plan for Vegetation Test Plot – Mine Site;
6. 1/31/00 - Work Plan for Open Pit and Subsidence Area Waiver Information Investigation and Report – Mine Site;
7. 1/31/00 - Work Plan for Comprehensive Water and Load Balance Study – Entire Site;
8. 1/31/00 - Work Plan for Background Characterization Study – Entire Site; and
9. 1/31/00 - Work Plan for Storage Cover and Test Plot Study – Tailings

MMD has received written comments from the following groups and agencies: Amigos Bravos; the Rio Grande Chapter of the Sierra Club; and the U.S. Environmental Protection Agency, Region 6. In addition a meeting was held with the Questa Mine Technical Review Committee (TRC) on February 25, 2000 to gather further public and agency input regarding the work plans. MMD also requested comments from the New Mexico Environment Department (NMED) (attached). NMED's Surface and Groundwater Bureaus will provide comments on the work plans in conjunction with the discharge plan process related to DP-1055 and DP-933.

Based on MMD's review and comments from other agencies and the public, Molycorp must revise the work plans before proceeding with the investigations. Specific comments are provided below and separated by work plan and the portion of the Questa Mine Site it addresses.

**GENERAL COMMENTS**



1. An Alternatives Subcommittee (AS) was formed during the TRC meeting on the February 28, 2000. The AS will generate at a list of various alternatives for reclamation and closeout submitted by the TRC, and provide recommendations to the TRC at the April 2000 meeting. Molycorp has agreed with this process to investigate alternatives set up by the TRC.

   MMD supports the proposed approach . However, Molycorp is responsible for ensuring that this approach does not compromise the timeframe established by regulatory deadline for closeout plan approval. Also, this approach is consistent with requests made by MMD to develop alternate reclamation approaches relative to the reclamation/closeout plan submitted in January of 1996. In an MMD letter dated May 28, 1999, MMD requested that Molycorp look at alternatives relative to waiver requests.

   The work plans in many cases appear to preclude alternative reclamation strategies or approaches other than those previously proposed by Molycorp. In concert with the AS approach described above, MMD recommends that the work plans be modified to allow for the evaluation of alternative reclamation plans. Additional information and development of alternative plans should coincide with the development of the work plans. MMD recommends that at a minimum, three to five alternatives should be developed and evaluated in the work plans and on-going Multiple Accounts Analysis (MAA) process.

2. MMD recommends, to be consistent with the MAA process, that Molycorp prepare a specific work plan outlining the sequence of activities necessary for a thorough evaluation of alternate closeout/reclamation measures. The work plan should provide a scope of work and timing section which integrates the steps to be taken in developing alternatives with those of the other work plans. This approach should consider timeframes required by the Mining Act extension.

3. The work plans in general assume that the mine site and tailings facility will be modified by future mining, and therefore evaluation of the existing conditions for final reclamation is unnecessary. Although the Mining Act requires that the closeout plan be based on the anticipated life of the mining operation, Molycorp should also evaluate existing conditions. The Questa Mine's reclamation should be considered in its present state for determination of financial assurance amounts to be posted at closeout plan approval.

4. Molycorp must provide sufficient information, via the development of the closeout plan , to reasonably predict impacts from the expansion of future mining units and future mining activities. This topic was discussed in MMD's May 28, 1999 letter to Molycorp under the heading of **Site Assessment and Expansion Areas**. The work plans must set the stage to provide this information. If this information cannot be provided, the expansions should be addressed later under revisions to the existing mine permit and closeout plan and undergo appropriate permitting modifications and financial assurance review.

5. Work plans addressing water quality issues have been submitted to NMED pursuant to the New

Mexico Water Quality Act, and Water Quality Control Commission regulations. Molycorp must incorporate NMED's comments on these work plans to ensure their requirements are met. MMD is committed to working with NMED to ensure the work plans meet the requirements of both agencies.

6. MMD recommends that Molycorp reference all relevant studies conducted on the Red River in developing these work plans, and not limit the use or development of data generated solely by Molycorp.

## SPECIFIC COMMENTS ON MINE SITE WORK PLANS

### I.Work Plan for Surface Erosion and Stability Analysis - Mine Site

1.1. Background

1. 1.1.i) "While no significant mass movement (instability) has been experienced in the piles, and erosion has been confined to relatively shallow surface erosion..." This statement was not supported during the recent inspection of the Sugar Shack South waste rock pile. Mass movement was evidenced by various slip and crack planes at the top of the benches where it appeared some mass movement had occurred. In addition, at least moderately deep erosion (ranging from greater than 6 inches and up to 15 feet deep) was evident, exposing unaltered waste rock underneath, and resulting in deposition of significant sediment at the toe of the piles. The work plan should be modified to recognize the inherent instability of "angle of repose" rock piles, and address existing features which suggest mass movement and heavy erosion are occurring in the rock piles.

2. 1.1.ii) The description assumes that the pit will be modified by future mining, and therefore precludes evaluation of its existing condition for final reclamation. The work plan needs to also evaluate the existing condition of the open pit as a reclamation alternative, because it may never be mined.

1.2 Rationale

1. The last line of this statement should be revised by deleting the word "create" and inserting in its place: "allow for re-establishment of." This will more accurately reflect the reclamation performance standard of the New Mexico Mining Act Rules (Rules).

1.3 Objectives

1. The last bullet of this section needs to be more definitive. In addition to "Evaluate alternative erosion control measures...," Molycorp needs to identify the measures to be evaluated, and how the measures might be selected for later evaluation.

2. An additional bullet needs to be added that addresses conceptual design of waste rock piles, the

open pit, and cave zone. The final step of the surface erosion and slope stability study should be to propose alternative conceptual designs for these mine units, based on the erosion control and slope stability evaluations conducted.

3. One of the objectives is "Analyze and predict the stability and future performance of these structures to the extent necessary for the development and demonstration of adequacy of remediation and closeout measures." This objective should be changed to compare the stability and future performance on existing structures (rock piles) with that of reduced slopes, and undisturbed stable slopes (no evident scarring) in the area currently supporting revegetation. The stability and future performance cannot be analyzed objectively except by comparison to reduced slopes and slopes exhibited in undisturbed areas which support revegetation and also demonstrate stability.

2.1 Scope of Work – Evaluation of the Waste Rock Piles

i) Surface Erosion

1. 2.1.i)c) This section needs to be clarified. It appears that "enumeration of vegetation" will be the identification of individual species present in a test plot, while "condition of vegetation" will be an estimate of cover and production. Please revise this statement to clarify how vegetation will be evaluated.

2. The "measure of visible erosion" in the second sentence must be based on observing the erosion itself, not just dependent on the status of vegetation. Please clarify how erosion will be evaluated.

3. 2.1.i)f) The first sentence of statement should be revised to state "Alternative methods for the control of surface erosion will be identified, evaluated, and proposed." MMD believes alternative methods should include evaluation of steep slope reclamation techniques based on the experience of other mine sites. This should include a review of information and examples of steep slope reclamation. Also, different types of cover material should be evaluated for control of surface erosion.

   Additionally, the evaluation results need to be carried further so that commitments are made for erosion control that MMD could approve. An additional sentence should be added to indicate that the erosion control results will be combined with slope stability results to develop alternative conceptual designs for outslopes of waste rock piles.

ii) Slope Stability

4. 2.1.ii)b) The geotechnical evaluation should compare the waste rock pile material with materials that have been proven successful in similar steep slope applications. Coarse durable particulate matter present in growth medium/cover soil has proven an important component of steep slope reclamation.

5. 2.1.ii)f) In this section please provide a reference for SLOPEW.

6. 2.1.ii)f) This section does not state how Factor of Safety (FOS) calculations will be utilized. Please add an additional paragraph statement in the Slope Stability section to address which slopes are stable and which are not. This should include the development of FOS standards that can be justified.

7. 2.1.ii)g) MMD agrees that it is necessary to evaluate the consequence of failure or identify where failure could occur. In addition to identifying where potential failures exist, there should be a geotechnical engineering solution provided. It should be stated that "Alternative methods of slope stability will be identified, evaluated, and proposed." An additional sentence should be added to indicate that the erosion control results will be combined with slope stability results to develop alternative conceptual designs for outslopes of waste rock piles.

   It is required under the Mining Act that all mine units be stable upon completion of the closeout plan. The work plan should state that it is the ultimate goal of the work plan and report to identify how this will be accomplished at closeout.

2.2 Evaluation of the Open Pit

1. An additional bullet should be added to indicate that the erosion control results will be combined with slope stability results to develop alternative conceptual designs for the open pit walls.

2. In the sixth bullet, the statement should be revised to state "...for remediation and closeout will be identified, evaluated, and proposed, including the effects..." The evaluation results need to be carried further so that commitments are made for stabilization that MMD could approve.

3. The seventh bullet should be expanded to indicate that the erosion control results will be combined with slope stability results to develop alternative conceptual designs for the open pit walls.

2.3 Evaluation of cave zone

1. Molycorp states in the second paragraph that "All eroded materials will be contained in the caves which will drain to the underground. They will therefore not be a source of surface water sediment load to the environment." These statements should be deleted from the work plan. These statements and their justification should be based on data and observations and be included in the resulting study.

2. Alternative methods for addressing human health, human safety, minimizing impacts of subsidence, and improving vegetation need to be identified, evaluated, and proposed. The evaluation results need to be carried further so that commitments are made for stabilization and erosion control of the cave zone that MMD could approve. The last paragraph should be expanded to indicate that the erosion control results will be combined with stabilization results to

develop alternative conceptual designs for the cave zone.

## II. Work Plan for Borrow Materials and Rooting Zone Investigation - Mine Site

1.2 Rationale

1. The work plan does not describe how "suitability for reclamation" will be determined. The criteria for soil suitability should be included in the work plan. It is recommended that the MMD Closeout Plan Guidelines and discussions with MMD staff be used in establishing the suitability parameters.

2. Molycorp must consider open pit wall benches when determining cover requirements.

3. The work plan appears to be biased in that it states, "...if, during the course of developing the closure/closeout plan, covering some of the mine rock piles becomes the preferred alternative, the borrow materials investigation will provide information sufficient to evaluate the suitability and cost of such cover for the rock piles designated." The work plan should assume that a number of different alternatives, rather than the "preferred alternative", will be evaluated for suitability and cost. The investigation should include an identification of all the available borrow material as the cover thickness has not been determined. This purpose should be stated in the work plan, and the work plan should describe how all the available borrow materials will be determined.

4. The work plan should define the use of the words "on site, off site, and in situ."

1.3 Objective

1. If characterization has been completed for the rock piles, Molycorp should include a discussion of the conclusion of suitability in the Borrow Materials Investigation Report.

2. If the MMD guidelines are not used for developing the suitability criteria then Molycorp must explain what criteria will be used to assess the suitability of soils. Whether the criteria is developed from local areas supporting vegetation, or criteria is developed from other sources, MMD must approve the proposed suitability criteria before it is used. This information should be included in the work plan.

3. Molycorp must clarify what is meant by off site sampling areas. The soil survey should be identified on a map showing on site and off site sampling areas.

4. The work plan should explain what is meant by "establish the quantities and characteristics through investigation and testing". A substantially more rigorous test plot program will have to be

initiated by Molycorp to evaluate soil suitability, including alternative growth mediums. In the absence of true test plot data, Molycorp will be required to plan a conservative reclamation approach with standard reclamation techniques employed.

2.0 Scope of work

1. The standard soil analysis should include an analysis of soluble aluminum content and available water holding capacity.

2. 2.1 (vi) states that areas with established plant growth will be a source for establishing suitability criteria. If established plant growth will be evaluated, the methodology for vegetative surveys and statistical analysis must be identified. How this information will be used in establishing criteria must be explained in detail.

3. 2.2.b The work plan must explain how volumes will be determined and what borrow volumes equate to different thicknesses of cover.

4. 2.4.a The amount of borrow material that may be necessary for cover of all disturbed areas assumes a larger volume of material may be necessary. The three areas with three to five backhoe test pits as described in the work plan, may be insufficient to identify the amount of reclamation materials necessary for some alternative reclamation plans. The number of candidate areas necessary should reflect all available local options for reclamation materials, and may involve significantly more sampling than described in the work plan. This should be stated in the work plan with estimated numbers of samples and approximate locations.

5. 2.6. The criteria for soil suitability of subsurface zones should also be included in the work plan. These criteria should be established before the investigation begins. Determination of the quantity of borrow materials needed should proceed or at least coincide with identification of the available materials.

6. Molycorp has provided under 2.1 of this section a list of sampling parameters to be applied to the mill and plant site. MMD requests that this list be expanded and that lists also be provided in the work plan to include other areas where soil or overburden/spoils material might be used for plant substrate. MMD suggests that the following list be incorporated into the work plan:

   a.) Borrow materials (on site and off site undisturbed areas supporting a plant community): pH, acid base accounting, electrical conductivity, sodium adsorption ratio, organic matter, available water holding capacity, texture, rock fragment content, permeability, nitrogen, phosphorus, potassium, iron, zinc, manganese, boron, calcium, magnesium, copper, aluminum, and molybdenum.

   b.) Onsite materials (spoils and overburden) and in situ materials (overburden and below soil

surface materials): pH, acid base accounting, electrical conductivity, sodium adsorption ratio, available water holding capacity, texture, rock fragment content, permeability, nitrogen, phosphorus, potassium, iron, zinc, manganese, boron, calcium, magnesium, copper, aluminum, and molybdenum.

## III. Work Plan for Vegetation Test Plot – Mine Site

General Comment

Overall MMD would like to see a more traditional test plot approach taken by Molycorp to evaluate plant growth potential at the mine site. This approach could be incorporated into the current, ongoing testing program at the mine. A more traditional approach could take the form of the establishment of well marked, fenced test plots designed to evaluate various seed mixtures, cover depths, cover materials, elevation, substrate material, aspect, soil amendments, etc.

1.2 Rationale

1. The purpose of a vegetation test plot program should be to determine what criteria or conditions must be present to create a healthy viable self sustaining plant community. The work plan should be revised to reflect this purpose.

   In a true test plot, conditions are controlled and the results should be compared with known input variables. If current vegetative monitoring results can be quantified and compared with known variables and controls, they may be used in the test plot program. MMD will need to review existing vegetation data to determine how much can be used for scientific comparisons.

1.3 Objective

1. The work plan must include plans for evaluation of alternative seeding, planting techniques, soil amendment applications and soil depths. Alternative revegetation techniques should be investigated. These should include candidate borrow materials in various cover designs (combinations of materials at various thicknesses) with differing combinations of vegetation at different aspects and elevations on the mine site. A more comprehensive revegetation test plot overall is highly recommended utilizing larger areas at multiple sites typical of all reclamation areas. In addition, fertilizer or organic matter amendments should be considered.

2. Baseline and background information on existing "test plots" should be evaluated to determine how much data from previous planting can be used. Evaluation criteria for previous plantings should be established based on not just establishment of plant species, but successful establishment. Molycorp must provide criteria for successful establishment such as mortality rate, colonization and vigor. The evaluation criteria should be described in the work plan and justification provided for use of any existing test plots.

3. Molycorp should be evaluating not only plantings, but plant communities likely to become established from seeding efforts. Successful establishment of seeded species should be evaluated using standard evaluation methods such as cover, diversity and density. This approach should be added to the work plan.

4. Criteria for evaluation of plant materials that are appropriate for reclamation at the site should be included in the work plan before beginning the study. Criteria for evaluating planting techniques should be identified in the work plan as well. The information gathered in the vegetation test plots should be used to establish or modify vegetation standards proposed in the closeout plan.

5. Since revegetation success standards will have to address parameters for cover, density and diversity as described in MMD's May 28, 1999 request for information letter, the work plan should include a test plot design which helps determine these parameters.

Scope of Work

1. The test plot design and layout should be identified in the work plan, including plans for mapping test plot areas and establishing sample sizes. Explanations for which areas will be included in the test plots should be given in the work plan.

2. 2.1 Molycorp must specify exactly what parameters are being tested. Molycorp should clearly identify the variables and controls if any. Several variables are mentioned in the scope of work, but it is unclear how each variable will be evaluated. For example, Molycorp must explain how fertilizer rates will be compared; how irrigation rates will be compared; and how differences in soil depth will be compared.

3. 2.1 a) Molycorp must identify the sampling procedures and methodologies. The work plan should explain how vegetation surveys will be conducted.

4. 2.2 The work plan must explain how plant materials proposed for reclamation will be evaluated to determine suitability for the mine site as well as explaining how success will be analyzed. This information must be explained in detail in the work plan.

5. 2.3 Molycorp must include descriptions of how soil depth, slope, aspect, planting and seeding rates will be evaluated. Molycorp must also explain how all of the parameters identified in section 2.3 will be evaluated. The criteria for evaluation must also be identified in the work plan.

6. 2.3 a) It is recommended that Molycorp include a comparison of organically amended plots with fertilized plots. The fertilizer testing regime should be included in the work plan as well as a description of what amounts and types of fertilizers will be tested.

7. Molycorp must explain why statistical data will not be available for the November report. Without

this information, no conclusions can be drawn and the data cannot be properly evaluated. The work plan should identify how and what data will be gathered and when.

8. Molycorp must describe how much of test plot program will be based on gathering data from existing vegetation versus how much will be based on areas not yet planted.

9. Molycorp needs to include the time frame for this program. MMD recommends that Molycorp commit to collecting data for at least 7 years.

## IV. Work Plan for Open Pit and Subsidence Area Waiver Information Investigation and Report – Mine Site

1.1 Background

1. It is not clear from the language in this section that Molycorp plans to look at the entire area proposed for waiver evaluation, within the context of the ultimate design limits for the mine site. The Work Plan should be modified to fully identify and evaluate all portions of the mine site to be impacted by expansion of the Open Pit and Subsidence areas, including:

   a) all future mine expansion, including the potential for both the full underground and open pit mine scenarios;

   b) calculations and analysis (modeling) which address the sequence of subsidence which will impact surface areas of the mine as mining progresses; and

   c) a detailed description of the anticipated impactsand the ultimate surface configuration resulting from the subsidence within the entire subsidence zone described in the Questa Mine's design limits.

1.2 Rationale

1. In this section Molycorp indicates that the pit slopes and the subsidence zones will be evaluated for a waiver.

   Rule 507.B states that

   > An operator may apply for a waiver for open pits or waste units from the requirement of achieving a post-mining land use or self-sustaining ecosystem.

   The pit slopes are eligible for a waiver, however the subsidence zone will not be eligible, unless Molycorp can demonstrate that the subsidence area, at closeout, will be an open pit or waste unit.

2. Molycorp states in the last sentence of Section 1.2 that "...to demonstrate the extent to which long-term stability conditions can be achieved..." This implies that long-term stability of the pit and subsidence area is optional. The phrase "...the extent to which..." should be deleted from the sentence. The Mining Act Rules require that a mine site be stable upon closeout.

1.3 Objectives

1. The four objectives should be stated more clearly. In addition, the term "feasibility" should be used in the first objective. MMD suggests the objectives be rewritten as follows:

   - Determine the potential for technical and economic feasibility to reclaim the open pit and subsidence area to achieve a PMLU or SSE.
   - Evaluate all viable alternatives for reclamation of the open pit and subsidence area with respect to technical feasibility, economic feasibility, and environmental soundness.
   - Demonstrate that the selected closeout measures will meet all applicable state and federal laws, regulations and standards relating to air, surface water, and ground water protection.
   - Describe how the open pit or waste unit will not pose a current or future hazard to public health and safety.

2. The additional description of each objective should be placed in a separate paragraph supporting the selection of objectives.

3. MMD requests that the work plan reference existing information related to determining the potential for technical and economic remediation of the pit slopes.

4. MMD requests that the work plan describe how the benefits and the cost analysis will be defined or measured.

1.4 Timing

1. The schedule for submittal of the waiver application needs to be accelerated. The submittal date of 4/30/01 does not allow adequate time for MMD to review and achieve resolution of issues before 12/31/01. The waiver application should be submitted by 1/31/01, when the alternatives analysis is submitted. Other dates in the critical path should be moved up accordingly.

2. Scope of Work

1. For clarity provide the scope of work in bullet format. As now written, this section appears to be a mix of objectives and timing, which was previously stated in Section 1.4. Timing and Scope could be integrated into one section. The scope of work appears to be:

   - Complete Surface Erosion and Slope Stability study.

- Complete vegetation program study.
- Evaluate alternatives for reclaiming pit and subsidence area, based on completed studies.
- Evaluate impacts of alternatives to surface and ground water.
- Get input from TRC.
- Integrate alternatives with other mine elements.
- Identify feasible alternatives.
- Develop waiver application.

2. The scope of work description provided could follow the above bullets.

## SPECIFIC COMMENTS ON TAILINGS FACILITY WORK PLANS

### I. Work Plan for Surface Erosion and Stability Analysis - Tailings Facility

2.1 Evaluation of the surface erosion potential of the tailings area

1. The second paragraph states that "ten plots will be used to visually evaluate erosional conditions or potential erosion." The plots are to include information on amount of cobble and/or gravel in the cover, vegetation density and estimated slope. MMD requests that Molycorp include the following information in the work plans:

   - The basis for selecting the location of the test plots (i.e., representativeness, random selections or visual erosion problems);
   - An explanation of test plot size and how test plots can approximate conditions for larger areas; and
   - A commitment to also measure vegetation type, cover, and diversity in the evaluation of erosional conditions and potemtial erosion.

2.2 Evaluation of the tailings dam slopes

a) surface erosion

1. 2.2.a)2) In this section Molycorp states that a minimum of one plot will be set up on each dam face (Dam 1 and Dam 4) to measure current surface erosion. These plots are planned to be placed at the base of the dams. As erosion often starts at the top of slopes in its preliminary stages, MMD suggests that Molycorp place additional plots at the face and crown of the dams as necessary.

2. 2.2.a)5) In this section Molycorp states that alternative control measures will be evaluated including the use of surface armoring or rip-rap and additional water management measures. MMD suggests

that Molycorp also include as alternatives to be evaluated:

- Slope reduction to 3:1 (horizontal:vertical) and slope breaks where possible depending on dam design; and
- Identification of soils types associated with each test plot.

## II. Work Plan for Borrow Materials Investigation – Tailings Facility

General Comments

MMD questions why this work plan does not address the suitability of the tailings themselves as a plant growth medium. The tailings are intended to provide the substrate below the cover for plant growth. Molycorp needs to address the suitability of the tailings, for plant growth, in the same fashion as the borrow material. If this information has already been provided, please address this in the work plans and incorporate this into the borrow materials investigation report. Please refer to MMD's comments under 2.0 Scope of Work for a list of parameters to sample for relative to the tailings suitability.

1.2. Rationale

1. Suitability for revegetation should be measured against a variety of criteria, including and in addition to geochemical and geotechnical characterization. In addition to the sample-specific testing described in the scope of work, additional evaluation should be done comparing the available materials to those that support vegetation locally, and against those characteristics known to be beneficial to supporting revegetation.

2. Scope of Work

1. 2.1 Molycorp must include volumetric estimates for all of the available borrow material to cover the tailings as the cover thickness has not been determined. The work plan should include a description of how these volumes will be determined, and a commitment to identify the location of the borrow areas that may eventually be used to provide cover.

2. Molycorp must describe in the work plan how the geochemical, geotechnical and soil suitability characteristics of the tailings will be determined and how they will be used to establish acceptability.

3. Molycorp must describe in the work plan how the geochemical, geotechnical and soil suitability characteristics of the borrow materials will be determined and how they will be used to establish acceptability.

4. Molycorp must include available water holding capacity in the soil sampling parameters.

5. Molycorp must explain how samples taken from areas currently supporting plants will be used for comparison to potential borrow materials.

6. Molycorp must justify the number of samples proposed for petrological, mineralogical, and particle size analysis. Molycorp should also justify number of samples used for parameters in Section 2.2, (c)(iv).

7. 2.2.b)and c) Molycorp has provided a list of geochemical and geotechnical soil parameters to test for in this section. MMD requests that Molycorp consider the following parameters when evaluating potential borrow areas:

   a.) pH, electrical conductivity, sodium adsorption ratio, available water holding capacity, texture, organic matter content, rock fragment content, permeability, nitrogen, phosphorus, potassium, iron, zinc, manganese, boron, calcium, magnesium, copper, and molybdenum.

8. 2.2. b) and c) MMD requests that Molycorp address the following parameters when performing analysis on the tailings:

   a.) pH, electrical conductivity, sodium adsorption ratio, available water holding capacity, texture, rock fragment content, bulk density, permeability, nitrogen, phosphorus, potassium, iron, zinc, manganese, boron, calcium, magnesium, copper, and molybdenum

## III. Work Plan for Storage Cover and Test Plot Study – Tailings Facility

General Comments

MMD's comments relative to this work plan are described below. Because this work plan deals mainly with water flux and quality, Molycorp will need to meet requirements of the NMED under the Water Quality Act and WQCC regulations, which may dictate the approach and adequacy of this study.

2. General Design of Storage Cover Test Plot Study

1. The tailings facility test plot study approach relies heavily upon the climactic conditions (precipitation/evaporation) of any given year. Annual variations in conditions could lead to significantly differing outcomes or results. Several years of monitoring of test plots may be necessary in order extract meaningful results. The work plan should provide commitments to continue monitoring to obtain meaningful results.

2. The work plan proposes to vegetate plots #2 and # 3, then gather data on net fluxes. It may take up to 3 growing seasons for a vegetation to be established. The work plan should provide a time frame for factoring this information into the model.

3. NMED made many suggestions in their April 5, 1999 letter to Molycorp, for changes to the Cover Placement Plan described in the Revised Closure Plan (Molycorp April 1998). Many of the

requests to provide further explanations in the work plan were not carried out. For example, NMED suggested Molycorp tests water flux through the cover with amendments to encourage rooting into the tailings. This idea was not incorporated into the work plan. MMD also contends that without somehow mixing or amending the tailings, plant roots will not adequately penetrate into the tailings.

3.0 Work Plan

Task 1.3 Met Station

1. The work plan should include information about the accuracy of the Bowen Ratio System (BRS) and how the error factor will be incorporated into the modeling results. Also Appendix B,C, indicated that the BRS will not be operated in the winter. The work plan should describe how the lack of winter data be compensated for in the modelling results and what months will it not be operated.

**Entire Site**

**I. Work Plan for Background Characterization Study – Entire Site**

General Comments

MMD's comments relative to this work plan are described below. Because this work plan deals mainly with water quality, Molycorp will need to meet requirements of the NMED under the Water Quality Act and WQCC regulations, which may dictate the approach and adequacy of this study.

2.2.1 Water Balance of Hansen Creek

1. The Preliminary water balance (Page 8) assumes increasing precipitation with elevation, thus greater precipitation in the vicinity of the scar areas. This rule is generally true, but may not be the case over relatively short distances within the canyon. Data from regional gauges is given in Figure 1, but the location of each gauge is not supplied. Please supply a map showing the location of each of these gauges. The data from the two proposed climate stations should be used to support or refute the assumption.

2.3 Integration into Load Balance for Red River Basin

1. Under this section Molycorp states "The second approach to estimating the sulfate load from the natural scar areas is to calculate the sulfate load in the Red River from mean annual runoff (MAR) and median average sulfate concentrations. " MMD questions whether or not this type of approach will in fact provide an accurate estimate of the sulfate load coming from the scar areas. This approach implies that sulfate loading is a steady state over time and does not take into account the high concentration, short duration that occurs naturally. Using the MAR approach may over estimate the amount of actual loading coming from the scars. MMD suggests that Molycorp provide a more accurate formula for providing this estimate.

3.1 Phase 1 of Background Study

1. 3.1, Task 1.1) It is stated on Page 11 that "soil loss gauging stations (marked staff gauges) will be installed across the prominent scar area of each study watershed." The work plan must describe the number gages where they will be placed and why. Additionally, the work plan needs to describe how this data is to be interpreted.

2. 3.1, Task 1.3) The Work Plan does not include installation of stream flow measuring devices at the confluences of Hansen Creek and Hottentot Creek with the Red River. Such devices should be installed at these locations, even if for a shorter duration than at the other stations, to establish the relationships between these stream locations and the measuring points upstream. This will make for more accurate estimates of loading to the Red River from these side streams.

3. 3.1, Task 1.3) Molycorp is proposing to monitor flow at the stream gauges on a weekly basis during the period of high flow (April – August). Molycorp should consider continuous monitoring of at least one gauge. Frequent monitoring should be from March through September.

3.2 Phase 2 of Background Study

1. 3.2, Task 2.1) It is stated on Page 14 that "selected samples [of alluvial material] will be bagged in air tight plastic bags and shipped to a specialist laboratory for either physical and/or geochemical characterization." Molycorp should clarify how it will determine the type of analysis that will be requested for a particular sample.

2. 3.2, Task 2.1) Figure 13 shows the proposed locations of the monitor wells to be installed to monitor ground water levels and quality of the 3 watersheds. The wells along the Red River should be located sufficiently far upstream from the Red River that the water being sampled is representative of the tributary watersheds and not the Red River.

3. 3.2, Task 2.1) The work plan should include a schedule of sampling events or Molycorp should commit to giving MMD at least one week advanced notification of any sampling events so that it may be present.

4. 3.2, Task 2.1) The work plan's Figure 13 shows an array of wells for the three study watersheds, upstream from the mine site, aligned parallel to the axis of the Red River. The resulting data would provide one-dimensional information relative to the source of groundwater sulfate, making it difficult to differentiate alluvial sulfate contributions coming from the Red River versus the associated tributary. The well array should measure the two-dimensional flow of groundwater allowing for greater accuracy of the measure of groundwater sulfate originating from the tributary under study.

5. 3.2, Task 2.2, Molycorp commits to measuring water levels in wells at least once a month. Water samples are to be collected for lab analysis quarterly. It is recommend that field parameters (conductivity, pH and temperature) be measured in wells whenever water levels are measured.

## II. Work Plan for Comprehensive Water and Load Balance Study - Entire Site

General Comments Overall

MMD's comments relative to this work plan are described below. Because this work plan deals mainly with water quality, Molycorp will need to meet requirements of the NMED under the Water Quality Act and WQCC regulations, which may dictate the approach and adequacy of this study.

MMD is concerned about predictions based on a model of this scale and complexity . MMD does not condone this approach as a mechanism for determining whether or not reclamation of mining disturbance will be beneficial to the Red River or surrounding areas. MMD would prefer that Molycorp conduct a more site specific program of on the ground measuring and monitoring of the layered bedrock and alluvial ground water system in the vicinity of the waste rock piles footprints. This a more accurate approach than a model which attempts to encompass a large number of parameters over a large expanse of the Red River Watershed.

If the agencies decide that it is appropriate to go ahead with the model, MMD has the following comments:

1. The work plan should commit to performing a sensitivity analysis on any of the parameters for any of the modeling being proposed.

2. The work plan should include documentation for each modeling code used in this study prior to work plan approval and implementing the models.

3. The work plan should commit to providing descriptions and justifications of all assumptions made for each model prior to implementing the models.

3.0 Work Plan

1. 3.0, Task 1.2) This task discusses Evapotranspiration Analysis. It is stated that the meteorological inputs to the WREVAP model, which will be used to estimate evapotranspiration, are "humidity, temperature, and sunshine duration". However, there is no mention of any biological inputs to the model. A description of how vegetation will be accounted for in areas of mining disturbance must be included in the work plan.

2. 3.0, Task 1.2) It is stated on Page 12 that, for the purpose of runoff analysis, "the average flow rate for each [gauge] station was adjusted to be representative of the 30-year period from 1961 to 1990." The work plan did not include a discussion on how the data was "adjusted". A detailed explanation should be submitted.

   The work plan also states an "attempt was made to naturalize the MAR values (i.e. to remove the influence of human activity." Details of this pre-processing should be also be included in the work plan.

3. 3.0, Task 2.4) On Page 16 it is stated that "The calibration parameters controlling runoff

generation will be adjusted until satisfactory agreement is reached between the modeled streamflow record and the frequent spot flow measurements. Comparisons between modeled and observed flows will occur at a minimum of two locations (approximately midway along the main stem and near the mouth)." Please explain what is meant by spot flow measurements and what is meant by frequent. Also, give the exact locations where all spot flow measurements will be made and which locations will be used in the calibration.

4. 3.0, Task 3.3) The Study includes groundwater modeling (and particle tracking) of the mine area. Robertson GeoConsultants must justify such modeling in this geologic setting which has been disturbed by underground mining.

5. 3.0, Task 5.2) This task describes the installation of 3 sets of groundwater wells within the Questa mine property boundary, the center well of each set being a pumping well and the adjacent wells being monitor wells screened over the upper 35 feet of the aquifer. It is stated that "consideration is being given to installing 2 – 3 additional mini-piezometers per monitoring well to allow water quality sampling at various depths." It is important to determine ground water quality at various depths if a proper load balance is to be achieved, so multi-depth samplers should be installed. Screening over an interval of 35 feet may average out important 2-dimensional information; such large intervals are not recommended.

6. 3.0, Tasks 6.7 and 7.5) These tasks include the simulation of post-closure scenarios. No detail is given on these scenarios. Such descriptions should be included in the work plan.

7. 3.0, Task 7.5) This task titled Simulation of Pre-Mining and Post-Closure Scenarios, gives very little detail. Estimates should be made of the load balance for the mine area prior to open-pit mining. This should be based on the extent of hydrothermal scaring that has been buried by the waste dumps or otherwise disturbed by the mine and by the information obtained on the other hydrothermal scars as a result of this and other studies. More detail should be given on the methods that will be used.

8. As indicated above, under general comment, MMD does not support the modeling approach in addressing the question of waste dump contribution to the Red River. MMD suggests the installation of a geometrically dense wellfield of monitoring and pump-test wells covering key cuts through the south boundary of the minesite. This well field, if placed properly, can provide direct on the ground data which can be ultimately used to address the question of contaminate flow from the mine site to the Red River.

Once Molycorp has received comments from NMED on the work plans, MMD recommends Molycorp meet with both agencies to discuss the work plans and resolve remaining issues. Time critical work plans will need to be finalized prior to March 31, 2000 in order to remain on schedule in accordance with the approved extension under the Mining Act. Please contact me directly at 827-1173 or Holland Shepherd at 827-5971 should you have any questions concerning this letter.

Sincerely

Fernando R. Martinez
Program Manager
Mining Act Reclamation Program
Mining and Minerals Division

FRM/HWS

cc: Douglas M. Bland, Director, Mining and Minerals Division
Kerrie E. Neet, Chief, Mine Regulatory Bureau
Mary Ann Menetrey, Mining Act Team Leader, NMED
Holland Shepherd, Permit Lead, MMD
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